

Delphinium, an attempt to distinguish the North American Species.

ASA GRAY.

This *essay* at an arrangement of our species of *Delphinium* is submitted to the botanists of the United States in the hope of eliciting, during the ensuing spring and summer, some observations on the living plants and such collections of specimens with their roots, fruit, and seed as may either confirm or invalidate the characters which I have endeavored to turn to account.

I make no reference to the naturalized species, of the section *Consolida*; nor to the two scarlet-flowered species of California, *D. nudicaule* and *D. cardinale* (§ *Phaenicodephis*), except to say that it would be well to verify the fact noted by that most experienced seed-raiser, Mr. William Thompson, that while *D. nudicaule* germinates (after the manner of *D. tricornis*) with prolonged connate cotyledon-petioles and hypogæous plumule, the nearly allied *D. cardinale* does not.

In our species of the *Delphiniastrum* section, I think good use may be made of the seeds and of the root, although most of our species have the same type of seed.

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| 1. Seed-coat close, smooth: root fasciculate-tuberous. | D. TRICORNE. |
| 2. Seed-coat cellular, more or less loose and rugulose:
stem scapiform from thickish branching roots. | |
| Leaves well dissected: raceme many-flowered. | D. SCAPOSUM. |
| Leaves merely 3-cleft: raceme few-flowered. | D. ULIGINOSUM. |
| 3. Seed-coat loose, cellular, becoming transversely rugose-squamellate: fascicled roots long: stem leafy. | D. AZUREUM. |
| 4. Seeds with loose cellular coat either arilliform or when dry merely scarious-margined or winged at the angles, not at all squamelliferous: more or less leafy-stemmed. | |
| *Fasciculate roots elongating, not at all tuberiferous. | |
| +Stem strict, tall or robust, many-leaved: raceme many-flowered: pedicels seldom longer than the flower or fruit, ascending or erect: follicles erect or nearly so, short-oblong. | |

As in Megarrhiza ar.

- Alleghany species, slender-stemmed: small flowers canescent-puberulent. D. EXALTATUM.
- Californian, stout: sordid flowers villous. D. CALIFORNICUM.
- Rocky Mountains to Oregon, etc.: flowers glabrous, canescent puberulent, or barely pubescent outside. D. SCOPULORUM.
- + + Stem lax, several-few-leaved: pedicels of loose raceme spreading or ascending, mostly long: follicles elongated cylindraceous, often diverging at maturity: flowers pretty large.
- Stems 2 to 6 feet high: leaves mostly ample, the lobes acute: follicles recurving in age. D. TROLLIIFOLIUM.
- Stems a span to a foot high: lobes of the small leaves obtuse, mostly linear. D. BICOLOR.
- + + + Stem strictly erect, with few or sparse leaves, a foot or two high, bearing a virgate or narrow raceme, with ascending pedicels, at least the upper not longer than the spur: follicles oblong, not over half an inch in length, not recurving.
- Very glabrous, a foot or two high, robust: leaves thickish: sepals half an inch long, little surpassing the petals. D. ANDERSONI.
- Puberulent or glabrous, 1 to 3 feet high: leaves not thick; divisions or lobes few and linear: roots comparatively long and slender.
- Raceme a span to a foot long: sepals oval, over half inch long, much surpassing the petals, fully as long as the spur. D. PARRYI.
- Raceme and flowers smaller: sepals oblong, 3 or 4 lines long, hardly surpassing the petals, shorter than the spur. D. PARISHII.
- * * Fasciculate roots short and thickening, but not tuberiform: herbage puberulent or below hirsute: stem strict, a foot or two high: leaves not large: raceme spiciform or narrow: pedicels short, except some lower ones, ascending or erect: follicles oval or short oblong, erect, puberulent.

Raceme virgate, usually elongated and many-flowered : sepals oval, 4 or 5 lines long, hardly longer than petals or spur.

D. HESPERRIUM.

Raceme of few to several large flowers : sepals orbicular-obovate or oval, 5 to 9 lines long, much surpassing the petals : follicles turgid.

D. VARIEGATUM.

* * * Fasciculate-tuberous or grumous roots, *i. e.* a cluster of globular or oblong testiculate or sometimes palmate tubercles, bearing only fibrous rootlets.

+ Raceme spiciform and virgate, many-flowered, with erect or appressed pedicels shorter than the spur : stems strict.

Tall, somewhat velvety-pubescent : calyx externally pubescent.

D. SIMPLEX.

Lower, glabrous or inflorescence puberulent : leaves thickish.

D. DISTICHUM.

+ + Raceme loose, few-many-flowered : pedicels spreading or ascending, comparatively long, never appressed,

Long and lax, lower often 2 inches long : leaf lobes all narrow : follicles oblong-cylindrical, half to three-fourths inch long, at maturity almost always widely recurving : flowers large and not numerous.

D. MENZIESII.

An inch or less long, rarely longer : follicles oblong, hardly over half inch long or shorter, mostly erect : herbage glabrous or nearly so.

Spur not longer than sepals, thickish : lower leaves with broad or broadish divisions.

D. DECORUM.

Spur longer than sepals, slender.

Low, or slender and few-flowered : leaf-lobes all or mostly linear : sepals 3 or 4 lines long : root-tubercles disposed to be fusiform.

D. PAUCIFLORUM.

Strict, 2 feet high, with rather many-flowered raceme : leaf-lobes lanceolate : petals all bright blue.

D. NUTTALLII.

Such a key is far from satisfactory.

D. tricornis Michx. does not extend further west than Minnesota and Arkansas.

D. scaposum Greene belongs to S. Utah and Arizona, in the latter territory accompanying *D. azureum*. More fruit of it is desirable.

D. uliginosum Curran seems to be a near relative of the preceding. It is imperfectly known, only at one station, in Lake Co., California.

D. azureum Michx., with its var. **vimineum**, extends from Saskatchewan and from N. Carolina to Arizona and Mexico. The seeds should well distinguish it.

D. exaltatum Ait. is our most eastern species and can not be confounded.

D. Californicum Torr. & Gray seems also quite peculiar, and is restricted to the Californian coast district.

D. scopulorum Gray I take to be a collective species, of the Rocky Mountains and northwestward, to the type of which I am constrained to annex the following varieties:

Var. **stachydeum**. A form with narrow leaf-lobes and strict stem (3 to 7 feet high), upper part of this with the long and dense spiciform raceme and outside of flower cinereous-puberulent.—Interior of Oregon, *Cusick*. New Mexico and Arizona, *Pringle*.

Var. **glaucum**. Like the other broader-leaved forms, sometimes glaucous, even the pedicels glabrous or only obscurely glandular-puberulent, and follicles glabrous.—*D. glaucum* Watson. Sierra Nevada, California, to Washington Territory, and even to the Yukon River. Connects with

Var. **subalpinum**. A foot to a yard or more high, with shorter raceme of larger and deeper-colored flowers, the inflorescence and even upper part of stem viscidly pubescent or villous, and follicles glabrous.—This is *D. elatum* Gray in Am. Jour. Sci., *D. occidentale* Watson, and is the analogue of *D. alpinum* of Europe. It occurs through the higher mountains of Colorado to those of E. Oregon.

D. trolliifolium Gray occurs on the Columbia River, below the Dalles, and in N. W. California, and is evidently a species of woodland or shade.

D. bicolor Nutt., a low species of the higher Rocky Mountains, and of those of E. Oregon, etc., with the inflorescence and flowers somewhat of *D. Menziesii*, proves to have deep and long (instead of tuberiferous) roots. It is *D. Menziesii* var. *Utahense* Watson, Bot. King. Exp.

D. Andersonii is *D. Menziesii* Watson l. c., as to Nevada plant, and mainly *D. decorum* var. *Nevadense* of the Botany of California. It belongs to the mountains of W. Nevada and the adjacent Sierra Nevada. More specimens in fruit are desirable.

D. Parryi is founded on specimens collected in San Bernardino Co., California, by Parry in 1850, Parry and Lemmon in 1876, and by Parish; also apparently the same collected near Santa Barbara by Brewer.

D. Parishii is a rather low and rigid-stemmed species, much smaller-flowered than the preceding, collected at Agua Caliente, on the southeastern borders of California, by Parish, and in adjacent Lower California by Orcutt.

D. hesperium is a common Californian species, which has passed for *D. simplex* and for Californian *D. azureum*. It appears to abound from Mariposa Co. and from Monterey northward, and it reaches W. Oregon. The roots of this and the next species are intermediate in character between the merely fasciculate and the tuberiform types, but rather of the former.

D. variegatum Torr. & Gray is very well marked in character, and is one of the most showy species. Bentham, in Pl. Hartw. 295, took it for *D. decorum*, but wrongly. We know it only in California, from Monterey to the Upper Sacramento Valley.

The remaining species have genuine grumous or tuberiform roots, although, as to

D. simplex Dougl., this is only an inference; for the roots of Douglas' plant, and of Spalding's from the same district (W. Idaho), which accord in character, are wanting in the specimens. But the plant comes near to the following, which has commonly been taken for it. Further knowledge of this species is much desired.

D. distichum Geyer in Hook. Lond. Jour. Bot. vi. 67. *D. azureum* Torr. in Bot. Wilkes' Exped. Common on the low prairies of E. Oregon and Washington Territory, and extending to Montana.

D. Menziesii DC. Chiefly near the coast; Brit. Columbia to Oregon and northern part of California. There are puzzling specimens, but it appears to be the only grumose-rooted species with pretty large and slender peduncled flowers, succeeded by long and narrow divergently recurved follicles. Yet sometimes these seem to remain erect.

D. decorum Fisch. & Meyer. This is a low and lax

species of the western part of California, extending eastward to the Sierra Nevada, of very variable foliage, but comparatively broad-leaved. Indeed the rounded lower leaves are sometimes barely 3-lobed, and the divisions commonly round-ovate or cuneiform. The typical form (the plant raised in the St. Petersburg garden, from seeds gathered at the Ross Colony—of which an original has been obligingly sent me for identification) has flowers as large as those of *D. Menziesii*. Other specimens agree with this; but not rarely, both in the northern and southern districts, it is much smaller-flowered, and passes freely into

Var. **patens**, the *D. patens* Benth. Pl. Hartw. This is a common form, with narrow leaf-lobes, and a narrower raceme of rather small flowers, the pedicels in fruit ascending. It would be taken for a quite distinct species, except for the intermediate forms.

D. pauciflorum Nutt. The type of this species occurs in the Rocky Mountains, from Wyoming and adjacent parts of Colorado to Idaho, and a slender form reaches the eastern borders of Washington Territory, and also California, where

Var. **depauperatum**, taken to be *D. depauperatum* Nutt. in Torr. & Gray, having broader leaf-lobes, may really be only an attenuate form of *D. decorum* var. *patens*. Additional materials and well formed fruit are wanted.

D. Nuttallii. So named because in our herbarium it is "D. simplex" of Nuttall. It is a moderately tall species, with grumose root, apparently quite distinct in character, occurring in low grounds along and near the Columbia River, above the Dalles, where it has been of late abundantly collected by Howell, Henderson, Suksdorf, etc. Nuttall's specimen is ticketed "Columbia Plains."

On the causes of the variations in the contents of sucrose in *Sorghum saccharatum*.

HARVEY W. WILEY.

For some years I have been investigating the *Sorghum saccharatum* in respect of its adaptability to the production of sugar.

During this time many difficulties have been encountered and these troubles have all been overcome with one excep-